

This is an update to our previous article about making your own version of Marlin 1.1.6/ 1.1.7/1.1.8. You will also find in the zip file below Creality's original firmware but I have gone ahead and enabled the very important setting of thermal protection. So if you want to keep their power resume feature but still run the older Marlin firmware then you can go right ahead.

## Finally!!!!

When Creality released their firmware the guys over at Marlin were able to get a look inside and have integrated their power resume into the firmware and with this one it is now enabled.

Before we start: This is for the [CR-10S](#) and not the CR-10. Don't use this firmware or follow these instructions for the CR-10. It is a different board and uses different settings. The older CR-10 uses a MELZI board which has less memory so in order to get it to work you will have to remove a lot of options to get everything to fit.

The firmware for the CR-10S is based on Marlin <http://marlinfw.org> which is an open source project and as such means you can modify the source code as you want. While this article will be long and involved, I will get right to the point and just give you the .hex file and you can go ahead and just install it and close out this page. This version has mesh bed leveling, baby stepping and EEPROM storage enabled.

Inside the zip is a file called instructions.pdf on how to flash your firmware.

However, if you're still reading this then we will go ahead and get moving. Let's install and configure the software and give you a quick lesson on what we will be doing.

1. You will need to download and install the Arduino IDE. <https://www.arduino.cc/en/Main/Software>
2. Next you will need to download and install the U8glib library. [https://bintray.com/olikraus/u8glib/download\\_file?file\\_path=u8glib\\_arduino\\_v1.18.1.zip](https://bintray.com/olikraus/u8glib/download_file?file_path=u8glib_arduino_v1.18.1.zip) and then from inside Arduino go to *sketch>include library>add zip library* and select the zip file. This is a library used to run the LCD display.
3. A preference we should setup inside of Arduino is to show line numbers. This will help us guide our way through the code and I will be referring to line numbers and the variable names for version 1.1.9. If you are reading this and using a different firmware version then line numbers may have changed but most likely the variable names will be the same. Now in the Arduino software go to *File>Preferences* and put a check mark in the box next to Display Line Number.
4. Finally you need to download the 1.1.9 firmware <http://marlinfw.org/meta/download/> and unzip the folder. Don't rename the folder or move the files around inside it. You can put it anywhere you like to work on it. Go into the folders till you find Marlin.ino and open that file from inside Arduino IDE. It will open the full project and put all the files into separate tabs along the top.

Now we are ready to get to work modifying things. Most of the work we will be doing will be in *Configuration.h* but we will be touching a few other ones. I will call those out later on. In Arduino if a line is "commented" this means that the instructions on that line are ignored. Marlin is well written and most of what we be doing is uncommenting an option or changing a value of something. To uncomment a line you just remove the two forward slashes // at the beginning of the line. To comment out a line you will just add // at the start of the line.

# Configurations.h

*This is where most of the work is done. It has all the basic settings in this one file.*

Line 119: **#define BAUDRATE 115200**

*This is the speed that it communicates over USB. It could be one of the faster speeds but honestly this is enough.*

Line 127: **#define MOTHERBOARD BOARD\_RAMPS\_14\_EFB**

*There are many boards that support Marlin and this is one of them. It is based off the very popular board RAMPS. It should already be set to this but I just wanted to draw your attention to this line.*

Line 132: **#define CUSTOM\_MACHINE\_NAME "CR-10S"**

*Uncomment then change the name between the quotes. When your machine starts up this is the name that is displayed in the bottom left of the screen. It can be anything you want between the quotes, even Printer McPrintface if you like.*

Line 145: **#define DEFAULT\_NOMINAL\_FILAMENT\_DIA 1.75**

*Here we set what size filament will be used in the machine.*

Line 306: **#define TEMP\_SENSOR\_0 1**

*This sets the type of sensor used for measuring the hotend temperature. For the stock hotend you will use "1" and for an E3Dv6 hotend you will use "5"*

Line 311: **#define TEMP\_SENSOR\_BED 1**

*This sets the bed sensor for the stock bed.*

Line 346: **#define HEATER\_0\_MAXTEMP 250**

*This is the limit for how hot your hotend will go. For the stock hotend you should set it for 250 and for an E3Dv6 hotend you can set it to 300.*

Line 351: **#define BED\_MAXTEMP 120**

*This is the limit for how hot your bed will go. In this case we can set it to 120 but honestly you will be lucky to ever go above 80c.*

Line 476: **#define THERMAL\_PROTECTION\_HOTENDS**

Line 477: **#define THERMAL\_PROTECTION\_BED**

*These two lines are what protects your machine from thermal runaway. While they are already uncommented I wanted to still point them out so you know to pay attention to them.*

Line 601: **#define DEFAULT\_AXIS\_STEPS\_PER\_UNIT { 80, 80, 400, 93 }**

*This is the amount of steps your printer has to use to move a specific distance. Things like drivers, motors, gearing, screws can change these numbers but the ones above are good for a stock CR-10S. These can be tuned later from the control screen thanks to the EEPROM settings we will be enabling later.*

Line 608: **#define DEFAULT\_MAX\_FEEDRATE { 300, 300, 5, 25 }**

*This is the fastest the machine will move in all directions.*

Line 626: **#define DEFAULT\_ACCELERATION 500**

Acceleration is the rate of change of speed. It is defined in mm/s<sup>2</sup>. Your printer slows down when changing direction and then speeds back up again in straight lines. This line is the acceleration the printer will make during printing moves. 575 is fairly slow, but for a printer like the CR10S with a big moving bed, it will help prevent [ringing](#).

Line 627: **#define DEFAULT\_RETRACT\_ACCELERATION 500**

*This is the acceleration applied to your extruder retraction. You want this as high as it can go before the filament starts stripping out to help prevent straining.*

Line 628: **#define DEFAULT\_TRAVEL\_ACCELERATION 1000**

*This is the acceleration of your printer when it is not printing. Since it is not printing at the time, it can be a little higher since you won't be able to see the ringing. If it is too high, you could see skipped steps and layer shifts.*

Line 841: **#define INVERT\_X\_DIR false**

Line 842: **#define INVERT\_Y\_DIR false**

Line 843: **#define INVERT\_Z\_DIR true**

*These 3 lines define the direction of each axis. If your machine moves in the opposite direction of what you expect then change it to true or false.*

Line 872: **#define X\_BED\_SIZE 300**

Line 873: **#define Y\_BED\_SIZE 300**

Line 881: **#define Z\_MAX\_POS 400**

*This is where we set the actual bed size of your printer and the Z height.*

Line 920: Uncomment **#define FILAMENT\_RUNOUT\_SENSOR**

*This will enable the filament sensor.*

Line 923: **#define FIL\_RUNOUT\_INVERTING true**

*Here we are changing the way the switch on the filament sensor works.*

Line 970: Uncomment **#define MESH\_BED\_LEVELING**

*This is the fun part. No probe, no hardware. This allows you to level the bed at multiple points manually and it will create a 3D mesh of the surface to allow you to print on an uneven bed. It will use the manual bed leveling as defined [here](#).*

Line 1013: **#define GRID\_MAX\_POINTS\_X 3**

*We are setting this to 3 which means it will have you level 3 times along the X axis and 3 times along the Y axis for a total of 9 points. If you set this to 5 then it would mean you have to adjust level 25 times on the bed. 3 is a really good number for this. It should already be set to this but I just wanted to draw your attention to this line.*

Line 1092: Uncomment **#define LCD\_BED\_LEVELING**

*This adds the option to run mesh bed leveling to the LCD screen.*

Line 1100: Uncomment **#define LEVEL\_BED\_CORNERS**

*This adds the option to level the corners of your bed before running mesh leveling.*

Line 1216: Uncomment **#define EEPROM\_SETTINGS**

*This allows you to adjust things like offsets and steps and store them.*

Line 1217: Uncomment **#define DISABLE\_M503**

*This is a command that shows the settings as they were set in the firmware and not the ones you changed in the EEPROM. We are disabling this to save some memory.*

Line 1248: **#define PREHEAT\_1\_TEMP\_HOTEND 205**

Line 1249: **#define PREHEAT\_1\_TEMP\_BED 60**

Line 1250: **#define PREHEAT\_1\_FAN\_SPEED 0**

Line 1252: **#define PREHEAT\_2\_TEMP\_HOTEND 250**

Line 1253: **#define PREHEAT\_2\_TEMP\_BED 80**

Line 1254: **#define PREHEAT\_2\_FAN\_SPEED 0**

*The lines 1248-1254 set the temps and fan speeds for the menu items to preheat for PLA and ABS.*

Line 1267: Uncomment **#define NOZZLE\_PARK\_FEATURE**

*This is required for the pause feature and is used to establish where to park the nozzle*

Line 1419: Uncomment **#define SDSUPPORT**

*This enables the SD card slot so you can print from SD.*

Line 1453: Uncomment **#define ENCODER\_PULSES\_PER\_STEP 1**

*Leave this at 1 for the CR-10S*

Line 1459: Uncomment **#define ENCODER\_STEPS\_PER\_MENU\_ITEM 5**

*This is how far the knob needs to turn to move between menu items. Make this number lower if it is too sensitive and higher if it is not.*

Line 1499: Uncomment **#define SPEAKER**

*This will let the machine beep and make sounds.*

Line 1649: Uncomment **#define  
REPRAP\_DISCOUNT\_FULL\_GRAPHIC\_SMART\_CONTROLLER**

*This enables the LCD screen. When we first installed U8Glib library, it was for this option.*

## Configuration\_adv.h

*This is where the more advance settings are configured. If you don't find what you're looking for in the configuration.h file then odds are it will be here.*

Line 591: Uncomment **#define POWER\_LOSS\_RECOVERY**

*This is what everyone has been waiting for. Power loss recovery. While it is a neat feature you may want to leave it disabled. It will constantly write to your SD card the current state of the print and that can wear out your SD card much faster than expected.*

Line 593: Uncomment **#define POWER\_LOSS\_PIN**

*This sets the pin to detect power loss*

Line 594: Uncomment **#define POWER\_LOSS\_STATE**

*This is the state of pin indicating power loss.*

Line 742: Uncomment **#define BABYSTEPPING**

*Baby stepping allows you to adjust the Z axis while printing to help get the perfect 1<sup>st</sup> layer.*

Line 746: **#define BABYSTEP\_MULTIPLICATOR 5**

*This is how much your Z axis will move per rotation on the knob. I find 5 is a good number but if you want finer control then lower this number. IF you want it to move more per click then increase this number.*

Line 748: Uncomment **#define DOUBLECLICK\_FOR\_Z\_BABYSTEPPING**

*This makes it so if you want to adjust baby stepping then you can press the control knob two times quickly and you will enter baby step mode.*

Line 793: Comment out **// #define ARC\_SUPPORT**

*Not really used since most slicers don't do this function by default. If we disable it then we save even more memory.*

Line 976: Uncomment **#define ADVANCED\_PAUSE\_FEATURE**

*This is for the filament runout sensor. It will home the hotend and unload the filament from the nozzle. Then once you load more filament it will wait till it's extruding before beginning the print.*

## **Pins\_RAMPS.h**

*This file is where the board pins are configured. Each pin on a board has to be addressed for all the features in the other files to know where to go. We will be using the RAMPS 1.4 board that we configured in the configuration.h file and modifying some of the pins to change it over to work with the Creality board.*

Line 74: **#define X\_MAX\_PIN -1**

*We are changing this one value to disable the X\_MAX\_PIN which conflicts with the filament sensor.*

Line 282: **#define FIL\_RUNOUT\_PIN 2**

*We are changing this one value from 4 to 2 so we are using the right pin for the filament sensor.*

Line 427: **#define SD\_DETECT\_PIN -1**

*We are changing this one value to disable the SD\_DETECT\_PIN which is not used on the Creality board.*

Line 439: **#define SD\_DETECT\_PIN -1**

*We are changing this one value to disable the SD\_DETECT\_PIN which is not used on the Creality board. You will notice that I changed this on an earlier line. I am doing it twice just in case someone is using the older LCD board but wants to use this firmware as well.*

**All done! Save your work.**

Wow, you really have been sticking with me this whole time and you have modified everything and you are ready to build your firmware and install it. Kudos for sticking with me this whole time.

1. Select *Tools>Board>Arduino/Genuino Mega or Mega 2560* and then *Tools>Processor>ATMega2560 (Mega 2560)* and then select the COM port for your printer. Did I mention that you should have already plugged your printer into your computer?
2. Now we want to verify and compile the code. You can do this by clicking on the checkmark icon in the tool bar or by going to *Sketch>Verify/Compile*
3. If you got no errors then congratulations and now you are ready to upload the firmware. Go to *Sketch>Upload* or click on the icon in the toolbar that is an arrow pointing to the right.
4. Now you are all set and good to go, enjoy your new firmware. Let us know what you think and if you think we should do anything more.

